

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An optical system for directing light from a light source to a predetermined plane, comprising:

at least one optical element disposed in an inside space of said optical system;

a measuring mechanism for measuring a surface shape of the at least one optical element;

and

a temperature controlling mechanism disposed across from a region of the optical element for absorbing heat to cool the region; and

~~a temperature controller for controlling a temperature of the at least one optical element~~
the temperature controlling mechanism on the basis of the measurement made by said measuring mechanism.
2. (Original) An optical system according to claim 1, wherein said measuring mechanism performs position measurement to a surface of the at least one optical element, at plural locations on that surface.
3. (Original) An exposure apparatus including an optical system as recited in claim 1.
4. (Original) A device manufacturing method, comprising the steps of:

exposing an object to be exposed, by use of an exposure apparatus as recited in claim 3;

and

developing the exposed object.

5. (Currently Amended) An optical system for directing light from a light source to a predetermined plane, comprising:

an optical element;

a measuring mechanism for performing position measurement to a surface of the optical element, at plural measurement points on that surface;

a first temperature controlling mechanism for controlling temperature of a first control region of the optical element, the first temperature controlling mechanism being disposed across from the first control region of the optical element for absorbing heat to cool the region;

a second temperature controlling mechanism for controlling temperature of a second control region of the optical element; and

a temperature controller for controlling said first and second temperature controlling mechanisms on the basis of the measurement made by said measuring mechanism.

6. (Original) An optical system according to claim 5, wherein the first control region is at a top or front face side of the optical element while the second control region is at a bottom or rear face side of the optical element.

7. (Original) An optical system according to claim 5, wherein both of the first and second control regions are at a bottom or rear face side of the optical element.

8. (Original) An optical system according to claim 5, wherein both of the first and second control regions are at a top or rear face side of the optical element.
9. (Original) An optical system according to claim 5, wherein the surface of the optical element is one of reflective surface, refractive surface and diffractive surface.
10. (Original) An optical system according to claim 5, wherein said temperature controller controls said first and second temperature controlling mechanisms so that, through application of a stress to the optical element, a result of measurement made by said measuring mechanism is held in a predetermined range.
11. (Original) An optical system according to claim 5, wherein said temperature controller controls said first and second temperature controlling mechanisms on the basis of the measurement made by said measuring mechanism, so that different temperatures are defined at the first and second control regions, respectively.
12. (Original) An optical system according to claim 5, wherein said measuring mechanism is operable to measure a shape of the surface of the optical element, with respect to two sections being approximately perpendicular to each other.
13. (Original) An optical system according to claim 12, wherein the two approximately perpendicular sections are approximately registered with a lengthwise direction and a widthwise

direction of a predetermined region of the optical element which region is to be illuminated with light.

14. (Original) An optical system according to claim 13, wherein said temperature controller performs temperature control so as to reduce deformation of the optical element with respect to the two directions being approximately perpendicular to each other, to be measured by said measuring mechanism.

15. (Original) An optical system according to claim 5, wherein said temperature controller performs different temperature controls to the first and second control regions, respectively.

16. (Original) An optical system according to claim 5, wherein at least one of the plural measurement points is inside a predetermined region of the optical element which region is to be illuminated with light.

17. (Original) An optical system according to claim 5, wherein at least one of the plural measurement points is outside a predetermined region of the optical element which region is to be illuminated with light.

18. (Original) An optical system according to claim 5, wherein the plural measurement points are inside a predetermined region of the optical element which region is to be illuminated with light.

19. (Original) An optical system according to claim 5, wherein the plural measurement points are outside a predetermined region of the optical element which region is to be illuminated with light.

20. (Original) An optical system according to claim 5, wherein one of the plural measurement points is approximately at a center of a predetermined region of the optical element which region is to be illuminated with light.

21. (Original) An optical system according to claim 5, wherein said measuring mechanism performs position measurement to the surface of the optical element, at three or more measurement points on that surface.

22. (Original) An optical system according to claim 5, wherein the optical element has a linear expansion coefficient of not less than 0 ppb and not greater than 15 ppb.

23. (Original) An optical system according to claim 5, wherein the optical element has a linear expansion coefficient of not less than 0 ppb and not greater than 10 ppb.

24. (Original) An exposure apparatus including an optical system as recited in claim 5.

25. (Original) A device manufacturing method, comprising the steps of:

exposing an object to be exposed, by use of an exposure apparatus as recited in claim 24;
and
developing the exposed object.